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RATCHET WRENCH HAVING EXACT LIMIT EFFECT

BACKGROUND OF THE INVENTION

1. Field of the Invention

4 The present invention relates to a ratchet wrench, and more
5 particularly to a ratchet wrench having an exact limit effect.

6 2. Description of the Related Art

7 In general, a conventional ratchet wrench comprises a handle, a drive
8 head mounted on a distal end of the handle and having a first end formed with
9 a receiving hole, a mediate portion formed with a receiving recess
10 communicating with the receiving hole, and a second end formed with a
11 receiving chamber communicating with the receiving recess, a ratchet wheel
12 mounted in the receiving hole of the drive head, a pawl member pivotally
13 mounted in the receiving recess of the drive head and engaged with the ratchet
14 wheel, and a control knob rotatably mounted in the receiving chamber of the
15 drive head and rested on the pawl member to push the pawl member to press
16 the ratchet wheel to control the drive direction of the ratchet wheel. Thus, by
17 control of the control knob, the ratchet wheel is rotated in one direction only
18 when the drive head is rotated.

19 However, the control knob is not easily positioned in the receiving
20 chamber of the drive head rigidly and stably, thereby causing inconvenience to
21 a user when operating the control knob. In addition, the conventional ratchet

1 wrench has a complicated construction, thereby greatly increasing the costs of
2 fabrication.

SUMMARY OF THE INVENTION

4 The present invention is to mitigate and/or obviate the disadvantage
5 of the conventional ratchet wrench.

6 The primary objective of the present invention is to provide a ratchet
7 wrench having an exact limit effect.

8 Another objective of the present invention is to provide a ratchet
9 wrench that only needs to provide a limit spring to position the control knob
10 rigidly and stably, so that the ratchet wrench has a simplified construction,
11 thereby decreasing costs of fabrication.

12 A further objective of the present invention is to provide a ratchet
13 wrench, wherein the urging spring is supported and guided by the guide shaft
14 of the positioning plate, so that the positioning plate is not easily deformed,
15 thereby facilitating movement of the urging spring.

16 A further objective of the present invention is to provide a ratchet
17 wrench, wherein the positioning plate is urged on the positioning edge of the
18 pawl member rigidly and stably so as to position the pawl member exactly.

19 A further objective of the present invention is to provide a ratchet
20 wrench, wherein the control knob is rigidly and stably positioned in the
21 receiving chamber of the drive head by the limit spring, thereby facilitating a
22 user operating the control knob.

1 In accordance with the present invention, there is provided a ratchet
2 wrench, comprising:

3 a handle;

4 a drive head mounted on an end of the handle and having a first end
5 formed with a receiving hole, a mediate portion formed with a receiving recess
6 communicating with the receiving hole, and a second end formed with a
7 receiving chamber communicating with the receiving recess;

8 a ratchet wheel mounted in the receiving hole of the drive head;

9 a pawl member pivotally mounted in the receiving recess of the drive
10 head and engaged with the ratchet wheel;

11 a control knob rotatably mounted in the receiving chamber of the
12 drive head and rested on the pawl member to push the pawl member to press
13 the ratchet wheel, the control knob having an inside formed with a passage
14 radially extended through the control knob; and

15 a substantially C-shaped limit spring mounted on the control knob to
16 rotate with the control knob and having a mediate portion formed with a
17 insertion portion inserted into the passage of the control knob and two distal
18 ends each formed with an protruding locking portion that is movable to press
19 the drive head to position the limit spring and the control knob on the drive
20 head.

1 Further benefits and advantages of the present invention will become
2 apparent after a careful reading of the detailed description with appropriate
3 reference to the accompanying drawings.

4 **BRIEF DESCRIPTION OF THE DRAWINGS**

5 Fig. 1 is an exploded perspective view of a ratchet wrench in
6 accordance with the preferred embodiment of the present invention;

7 Fig. 2 is a partially cut-away plan cross-sectional assembly view of
8 the ratchet wrench as shown in Fig. 1;

9 Fig. 3 is a partially cut-away top plan cross-sectional assembly view
10 of the ratchet wrench as shown in Fig. 1;

11 Fig. 4 is a partially cut-away top plan cross-sectional assembly view
12 of a ratchet wrench in accordance with another embodiment of the present
13 invention; and

14 Fig. 5 is a partially cut-away top plan cross-sectional assembly view
15 of a ratchet wrench in accordance with another embodiment of the present
16 invention.

17 **DETAILED DESCRIPTION OF THE INVENTION**

18 Referring to the drawings and initially to Figs. 1-3, a ratchet wrench
19 in accordance with the preferred embodiment of the present invention
20 comprises a handle 10, a drive head 11 mounted on an end of the handle 10 and
21 having a first end formed with a receiving hole 12, a mediate portion formed
22 with a receiving recess 13 communicating with the receiving hole 12, and a

1 second end formed with a receiving chamber 14 communicating with the
2 receiving recess 13, a ratchet wheel 20 mounted in the receiving hole 12 of the
3 drive head 11, a pawl member 25 pivotally mounted in the receiving recess 13
4 of the drive head 11 and engaged with the ratchet wheel 20, and a control knob
5 31 rotatably mounted in the receiving chamber 14 of the drive head 11 and
6 rested on the pawl member 25 to push the pawl member 25 to press the ratchet
7 wheel 20 to control the drive direction of the ratchet wheel 20. The
8 above-mentioned structure and manner of operation are conventional and will
9 not be further described in detail.

10 The ratchet wheel 20 is a substantially T-shaped socket. The ratchet
11 wheel 20 has a periphery formed with a plurality of ratchet teeth 21 and has a
12 bottom formed with an annular groove 22 for fixing a C-shaped snap ring 23
13 which is rested on a bottom of the drive head 11 to secure the ratchet wheel 20
14 on the drive head 11.

15 The pawl member 25 has a first side formed with a plurality of
16 engaging teeth 26 engaged with the ratchet teeth 21 of the ratchet wheel 20 and
17 a second side formed with an arcuate positioning edge 27.

18 The control knob 31 has an inside formed with a passage 32 radially
19 extended through the control knob 31 and aligned with the positioning edge 27
20 of the pawl member 25 and has a periphery formed with an annular snap
21 groove 34. Preferably, the snap groove 34 of the control knob 31 is located
22 under and communicated with the passage 32. The control knob 31 has a first

1 end formed with a drive handle 30 protruding outward from the drive head 11
2 and a second end formed with an enlarged resting plate 33 located adjacent to
3 the snap groove 34 and rested on the limit spring 35.

4 A substantially C-shaped limit spring 35 is mounted in the snap
5 groove 34 of the control knob 31 to rotate with the control knob 31 and has a
6 mediate portion formed with a substantially U-shaped insertion portion 36
7 inserted into the passage 32 of the control knob 31 and two distal ends each
8 formed with an arc-shaped protruding locking portion 37. The locking portion
9 37 of the limit spring 35 is bent outward and is movable with the limit spring
10 35 to abut a connection 18 of the receiving recess 13 and the receiving chamber
11 14 of the drive head 11 as shown in Fig. 3 to enhance the positioning effect of
12 the limit spring 35 on the control knob 31.

13 A substantially E-shaped positioning plate 40 is mounted in the
14 passage 32 of the control knob 31 and has a first end rested on the positioning
15 edge 27 of the pawl member 25, and an urging spring 45 is mounted in a
16 second end of the positioning plate 40 and urged between the positioning plate
17 40 and the drive head 11, so that the positioning plate 40 is urged on the
18 positioning edge 27 of the pawl member 25 rigidly and stably as shown in Fig.
19 2 so as to position the pawl member 25 exactly. The second end of the
20 positioning plate 40 is formed with two slits 41 and a guide shaft 42 located
21 between the two slits 41, and the urging spring 45 is mounted on the guide
22 shaft 42 and located between the two slits 41. Thus, the urging spring 45 is

1 supported and guided by the guide shaft 42 of the positioning plate 40, so that
2 the positioning plate 40 is not easily deformed, thereby facilitating movement
3 of the urging spring 45. In addition, the positioning plate 40 has a bottom
4 rested on the insertion portion 36 of the limit spring 35.

5 In operation, referring to Figs. 2 and 3 with reference to Fig. 1, the
6 control knob 31 is rotated by the drive handle 30, so that the positioning plate
7 40 mounted on the control knob 31 is moved by rotation of the control knob 31
8 to push the pawl member 25 to move into an included angle defined by the
9 ratchet wheel 20 and the inner edge of the drive head 11 to lock the ratchet
10 wheel 20 on the drive head 11 so as to control the drive direction of the ratchet
11 wheel 20. Thus, the ratchet wheel 20 is rotated in one direction only when the
12 drive head 11 is rotated.

13 At the same time, when the control knob 31 is rotated, the limit
14 spring 35 is also rotated. Thus, the locking portion 37 of one of the two distal
15 ends of the limit spring 35 is moved to abut the connection 18 of the receiving
16 recess 13 and the receiving chamber 14 of the drive head 11, and the locking
17 portion 37 of the other one of the two distal ends of the limit spring 35 is
18 moved to press an inner edge of the receiving chamber 14 of the drive head 11
19 as shown in Fig. 3 to produce a locking effect on the control knob 31, so that
20 the control knob 31 is rigidly and stably positioned in the receiving chamber 14
21 of the drive head 11 by the limit spring 35, thereby facilitating a user operating
22 the control knob 31.

1 Accordingly, the ratchet wrench only needs to provide a limit spring
2 35 to position the control knob 31 rigidly and stably, so that the ratchet wrench
3 has a simplified construction, thereby decreasing costs of fabrication. In
4 addition, the urging spring 45 is supported and guided by the guide shaft 42 of
5 the positioning plate 40, so that the positioning plate 40 is not easily deformed,
6 thereby facilitating movement of the urging spring 45. Further, the positioning
7 plate 40 is urged on the positioning edge 27 of the pawl member 25 rigidly and
8 stably so as to position the pawl member 25 exactly. Further, the control knob
9 31 is rigidly and stably positioned in the receiving chamber 14 of the drive
10 head 11 by the limit spring 35, thereby facilitating a user operating the control
11 knob 31.

12 Referring to Fig. 4, in accordance with another embodiment of the
13 present invention, the receiving chamber 14 of the drive head 11 has a wall
14 formed with two spaced arch-shaped locking recesses 15 located adjacent to
15 the handle 10. The control knob 31 has an inner side facing the pawl member
16 25, and the limit spring 35 is mounted on the inner side of the control knob 31,
17 wherein the locking portion 37 of one of the two distal ends of the limit spring
18 35 is inserted into and locked in a respective one of the two locking recesses 15
19 of the drive head 11, so that the control knob 31 is rigidly and stably positioned
20 in the receiving chamber 14 of the drive head 11 by the limit spring 35, thereby
21 facilitating a user operating the control knob 31.

1 Referring to Fig. 5, in accordance with another embodiment of the
2 present invention, the receiving chamber 14 of the drive head 11 has a wall
3 formed with an arch-shaped locking recess 16 located adjacent to the handle 10.
4 The control knob 31 has an inner side facing the pawl member 25, and the limit
5 spring 35 is mounted on the inner side of the control knob 31, wherein the
6 locking portion 37 of either one of the two distal ends of the limit spring 35 is
7 inserted into and locked in the locking recess 15 of the drive head 11, so that
8 the control knob 31 is rigidly and stably positioned in the receiving chamber 14
9 of the drive head 11 by the limit spring 35, thereby facilitating a user operating
10 the control knob 31.

11 Although the invention has been explained in relation to its preferred
12 embodiment(s) as mentioned above, it is to be understood that many other
13 possible modifications and variations can be made without departing from the
14 scope of the present invention. It is, therefore, contemplated that the appended
15 claim or claims will cover such modifications and variations that fall within the
16 true scope of the invention.